Improving Care for Acute and Chronic Problems with Smart Forms and Quality Dashboards

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Agenda

• Brief Introduction to Partners IS
• Motivation for Smart Forms and Quality Dashboards
  — LMR, Patient Gateway
  — The Signature Initiatives -> High Performance Medicine
  — Partners Advanced Informatics Infrastructure
• SFQD Study Design
  — Preliminary Focus Group and Survey Data
• Architecture and Software Overview
  — Smart Forms
  — Quality Dashboards
• Discussion
Partners HealthCare – NHII *in situ*

- Founded in 1994
  - Brigham and Women’s Hospital
  - Massachusetts General Hospital
- Now includes:
  - Community Physician Network
  - 2 Rehab Hospitals
  - 4 Community Hospitals
  - Affiliated cancer hospital – Dana Farber
- Common Clinical IT supported by Partners Information Systems
Overview of Partners IS: Scale of the Integration Effort

- 55,000 devices attached to the Partners network
- 45,000 users accounts
- 110 locations on the network
- 750 servers
- 800 applications
- 540 active projects
- 1,100 employees based in 19 locations
The Signature Initiatives are five System-wide projects with one common goal:

To deliver better care to patients.

- Care that is:
  - Safer
  - Better coordinated
  - More reliable in delivering proven interventions
- Systems that support providers in “doing the right thing.”
What Are the Signature Initiatives?

Infrastructure

1. Investing in quality and utilization infrastructure
   — Information systems
   — Other resources

Quality

2. Enhancing patient safety by reducing medication errors system-wide

3. Enhancing uniform high quality by measuring performance to benchmark for select inpatient and outpatient conditions

Efficiency

4. Expanding disease management programs by supporting activities for certain patients with chronic illnesses

5. Improving cost effectiveness through managing utilization trends and analysis of variance
Quite possibly the biggest development in patient care since the telephone.

When Alexander Graham Bell invented the telephone in Boston in 1875, he was able to call his assistant in a nearby room using a wire. Today your physician can instantly call up your medical history, test results, medications and physicians' notes on a computer screen.

It's called electronic medical record, EMR, and it's part of what we at Partners HealthCare call High Performance Medicine.

We began installing EMR in 2003. Today about 90 percent of our primary care physicians have it at our two academic medical centers, Brigham and Women's Hospital and Massachusetts General Hospital.

Two of our community hospitals, Faulkner Hospital and Newton-Wellesley Hospital are finalizing implementation of EMR now. Our hospitals in North Shore Medical Center expect full implementation by next June. Among our community-based primary care physicians, more than 60 percent are using EMR or are in the course of implementing it.

High Performance Medicine provides our doctors with guidance on the appropriate tests to order. For example, EMR tells them when an x-ray will be just as revealing as an MRI, but at a fraction of the cost. Physicians can write prescriptions on-line. This allows them to satisfy order the right medication, detect any allergies you might have, and know which other medications you are taking, in order to avoid dangerous drug interactions.

Prescribing by computer also displays which generic drugs are effective, which have the lowest co-pay, and which are covered by your insurance.

High Performance Medicine brings technological advances to the doctor's office, the pharmacy, and the neighborhood health center.

We believe EMR will soon be used as effortlessly as the telephone. But with the power to help your doctor diagnose, treat and heal.

For more information, go to www.Partners.org/HPM.

HIGH PERFORMANCE MEDICINE
Better, safer, more cost-effective care.
No one should have to decipher your doctor's handwriting to give you the right prescription.

When your pharmacist can read clearly what your physician prescribed, that means you're getting the right medication at the right dosage. This happens automatically when your doctor orders prescriptions by computer.

Physicians who prescribe by computer rather than pen and pad get alerts that point out allergies you might have to certain medications. They see all medications prescribed by other doctors in the Partners HealthCare system. This minimizes dangerous drug interactions. (Literally thousands of interactions are possible.)

There's no need to translate your doctor's handwriting. Or rely on your memory. Everything is clearly and securely kept in your doctor's computer.

Your doctor can use a coding system developed by Partners pharmacists that says which generic drugs are safe and effective alternatives to heavily advertised ones. It even tells them which prescriptions are covered by your insurance and have the lowest co-pay.

Medication orders are automated at our founding hospitals, Brigham and Women's and Massachusetts General, as well as at Faulkner Hospital and Newton-Wellesley Hospital. It is the process of being implemented at our hospitals in North Shore Medical Center.

About 60 percent of Partners community-based primary care physicians also can prescribe by computer and that number grows every week.

This upgrading is part of what we call High Performance Medicine. HPM takes advantage of digital technology to make our already outstanding care even better.

But the best reason for prescribing by computer is that it is safer for our patients. And it doesn't take an Egyptologist to understand that's good for all of us.

For more information, go to www.Partners.org/HPM.

HIGH PERFORMANCE MEDICINE
Better, safer, more cost-effective care.

BRIGHAM AND WOMEN'S HOSPITAL
A charitable non-profit organization
PARTNERS.
MASSACHUSETTS GENERAL HOSPITAL
Business Goals Drive IT Objectives

- **Business Goals**
  - Enhancing patient safety by reducing medication errors
  - Enhancing uniform high quality by measuring performance
  - Expanding disease management programs
  - Improving cost effectiveness through managing utilization trends
  - Improving patient care access and convenience

- **IT Objectives**
  - Support key business initiatives through the design and implementation of improved IT infrastructure
    - Bridge system silos to make information available everywhere
    - Achieve enterprise-wide interoperability of key data types to support decision support and data aggregation
    - Manage knowledge to achieve uniform best practices
    - Make results visible to drive process improvement
Increasing Enterprise Integration: Progressive Homogeneity via SOA

Increasing the level of enterprise integration is supported by core IT services that can be integrated with and/or accessed by site-based applications. These IT services integrate and communicate with the site-based and enterprise applications via a service-oriented architecture made up of layered components.

This approach leverages:
- A common technology infrastructure;
- Common data, terminology and rules (especially those associated with allergies, problems and medications);
- Shared clinical services and applications; and
- Customized views and capabilities for specific user types.
Many Partners’ applications utilize discrete data, logic and knowledge or rules; most are not integrated across sites – creating islands of information and supporting varying levels of functionality.
Future clinical applications will take advantage of shared repositories of enterprise data, knowledge, and logic, in a services-oriented architecture.
Welcome to the KM portal!

Announcements

We've changed!
With usability in mind, we recently undertook a redesign of our Knowledge Management portal. Alan Rose, our usability expert in CIND, has completed interface redesign for other Partners applications such as Patient Gateway and LMR to name a few. The Knowledge Management portal is almost a year old and we thought it was the right time to implement usability improvements and provide our users with easier to use search interfaces.

What has changed? First, we upgraded our code to .NET platform through the hard work of Web Integration Team and PHS Web Development. Second, we've improved our graphical interface and site layout, and we've added bread crumbs for improved longitudinal navigation. With filter-based search, you will find your option refine your search within the same screen without having to use the back button. With keyword search, navigation between pages of search results is easier to use. These are just a few of the improvements you will find.

If you are visiting the site for the first time, please visit our getting started guide which provides a overview of search capability and functions. You can also review the glossary of terms to familiarize yourself with our site's form and functionality.

If you have feedback related to the site's redesign, please email Cathryn Harris at thenews@partners.org who is coordinating the development, deployment efforts for this site.

This site is intended to help anyone at Partners who is engaged in embedding clinical knowledge into the various electronic health record systems share that knowledge with each other. Partners has a rich inventory of order sets, rules, reminders, expert doing databases, drug information, and documentation templates embedded in a rich array of clinical systems. The Partners Knowledge Management Team has begun the process to inventory and catalogue these assets to support sharing and efficient utilization.

You can access these assets in three ways:

- Keyword Search
- Browse by Topic
- Filter-based Search

Site navigation is organized by the four key domains of the Partners Signature Initiatives: Quality, Safety, Disease Management, and Trend Management:

- Filter-based search makes it possible to look at content comparatively. For example, if one would like to compare order sets for cardiac interventions at the Brigham and Women's Hospital and the Massachusetts General Hospital, then filter-based search is the simplest way to view information asked for these attributes.

- Alternatively, if one wants to see all the content related to managing oncology, then navigating through the Safety section of site navigation will be the simplest. For more information on this please go to "Getting Started". Our team will continue to catalogue and update in the upcoming years, particularly as more hospitals implement physician order entry systems and the LMR.

- In addition, in 2005, we'll begin implementing specialized tools to support better collaboration with subject matter experts in content development as well as more efficient management of the tracking, versioning, and collaborating needed for content management. We look forward to working with all of you to make the portal work for you.

If you are looking for content and cannot find it, or if you are having technical difficulty with the site, please contact the Help Desk at 617-732-5927 and open a ticket under the KNOWLEDGE MANAGEMENT queue, we'll be glad to help. Our hours of primary support are 8:30-4:30 Mon-Friday.
### Search Criteria

#### Clinical Disciplines
- All Clinical Disciplines
- Anesthesiology/Perioperative Medicine
- Behavioral Medicine
- Burn Management
- Cardiology (Interventional)
- Cardiac (Med/Int)
- Cardiology (Surgical)
- Emergency Medicine
- Endocrinology
- Gastroenterology
- General Medicine
- General Surgery
- GI Colorectal Surgery
- Hematology and Oncology
- Infectious Disease
- Allergy
- Nephrology
- Oncology
- Newborn/Neonatology
- Obstetrics and Gynecology
- Orthopedics

#### Filters
- **Entity:**
  - All Entities
  - BYH
  - MGH
  - CRCC

- **Venue:**
  - Adult Care
  - All Venues
  - Ambulatory Care

- **Patient Age Group:**
  - Adult
  - All Patient Age Groups
  - Pediatric

- **Application:**
  - All Applications
  - EIS2 Event Monitor
  - BICS Order Entry

#### Content Type:
- All Content Types
- Drug Information
- Expert Opinion

- **Patient Safety:**
  - Alerts and Notification
  - All Patient Safety
  - Consequent Order/Lab Display

- **Disease Management:**
  - All Disease Management
  - Coronal Artery Disease
  - Diabetes

### Results

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Content Type</th>
<th>Entity</th>
<th>Selected Search Filters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Surgery Post Op Pathway - BWH View Details</td>
<td>Order Sets and Templates</td>
<td>BYH</td>
<td>Clinical Disciplines: All Clinical Disciplines</td>
</tr>
</tbody>
</table>
| Arterial Embolization Protocol - MGH View Details         | Order Sets and Templates | MGH    | Entity: All Entities
| Cardiac SICU Additional Post Op Orders Transplant Patients - MGH View Details | Order Sets and Templates | MGH    | Venue: All Venues
| Cardiac Surgery Admission Pre-Op - BWH View Details      | Order Sets and Templates | BYH    | Patient Age Group: Adult
| Cardiac Surgery Admission Pre-Op - MGH View Details       | Order Sets and Templates | MGH    | Application: All Applications
| Cardiac Surgery Bypass Front Door Same Day Bypass - MGH   | Order Sets and Templates | MGH    | Content Type: All Content Types

CTRL - click to select multiple choices from the filters.
| Multi-Clinician Collaboration on a 300 x 5 Decision Table |
Secure Clinical Communication And Notification of Results

Automatic Reminders

Summary Flowsheets

Intuitive Chart Summary

Coded Clinical Data

Customizable Desktop
SFQD R&D Team Acknowledgements

• Clinical Investigators
  — Jeff Linder, MD, MPH
  — Jeff Schnipper, MD, MPH
  — John Orav, PhD

• Clinical Informatics
  — Jonathan Einbinder, MD, MPH
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  — Julie Fiskio
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  — Lana Tsurikova, MA, MSc
  — Lynn Volk, MA
  — Tony Yu, MD, MSc

• Application Development
  — Irene Galperin
  — Nina Plaks
  — Anatoly Postilnik
  — Boris Rudelson
  — Michael Vashevko

• Clinical Systems Management
  — Lynn Klokman
  — Eunice Jung

• Other
  — Steve Flammini, CTO
  — Joanne Tremblay
  — Cindy Spurr
  — Cindy Bero
  — Liz Mort, MD
  — Alan Cole, MD

AHRQ R01HS015169
Blackford Middleton, PI
CDSS Integrated into the Clinical Workflow

- Alerts & Reminders
- Therapeutic Guidance
- Assessment, Risk Stratification, Therapeutic Response
- Follow-up/Monitoring (Quality Dashboard)

Smart Forms
Interaction between data, analysis, and user:

- User of data is creator of data
- Data is collected as a by-product of routine care
- Analysis occurs within the information environment
- Analytic results are delivered to the provider during routine care
Captain, let me make something clear to you: I’m a doctor, not a !#$%^ computer operator.
Structured vs. Unstructured Data

Usefulness of Data

Impact on Usability

100% Free Text

100% Structured & Coded
Structured vs. Unstructured Data

Optimum Mix

Usefulness of Data

Impact on Usability

100% Free Text

100% Structured & Coded

SFQD Project Goals

• To develop common framework and approach to integrating improved clinical documentation with decision support in the LMR
  — Primary method will be through use of “Smart Forms”
  — Secondary method will be through use of “Quality Dashboards”
SFQD Secondary Goals

• To externalize knowledge elements and logic used in LMR smart forms, alerts & reminders, and quality dashboards
• To make use of external rules engine for all LMR clinical inference and decision support
• To improve usability of LMR (market competitiveness)
SFQD Specific Aims

- Specific Aim 1: To design and implement an integrated documentation-based clinical decision support and physician feedback system, provided in an electronic health record (EHR), to improve the management of patients with acute and chronic medical conditions.
- Specific Aim 2: To determine the effectiveness of documentation-based CDSS and physician feedback on documentation and the clinical management of patients with coronary artery disease and acute respiratory tract infections.
- Specific Aim 3: To assess the perceived value of EHR quality dashboards by clinicians and their marginal impact over smart forms on compliance with best practices in ARI and CAD.
Research Design

EHR alone

EHR with Smart Forms

EHR w/ Smart Forms & Quality Dashboards

Patients

Outcomes
Effects and Contrasts
Condition Dichotomy

• ARI
  — Acute condition
  — Errors of commission
  — Often a stand-alone urgent care visit
  — Decision support during visit only

• CAD & DM
  — Chronic conditions
  — Errors of omission
  — Usually in context of a full visit with multiple problems
  — Decision support before, during, and after visit
What is a Smart Form?

- Clinical documentation-based
- Actively engage user during workflow
- Organize relevant data
- Request new data
- Integrate decision support, ordering, patient education, and documentation
ARI Smart Form Features

- Structured data entry
- Patient data display
- Diagnosis detection
- Presentation of treatment options with integrated decision support
  — Based on coded data and final diagnosis (e.g., probability of strep throat)
- Printing of patient handouts
- Access to medical literature
Rapid capture of clinical information with drop down lists and check boxes

“All Normal” Check box
ARI Smart Form

Free text fields

Automatic importation of problems, allergies, medications, and vital signs
ARI Smart Form

Automatic conversion to free text

Detest, Edwina
11489994 (BWH)
02/12/1956 (50 yrs.) F

CHIEF COMPLAINT
Patient presents with a chief complaint of sore throat for 3 days.

SYMPTOMS
Patient complains of subjective fever, chills or feeling cold, feeling fatigued, tired, worn-out ("Wiped out") and sore throat.

Patient denies documented fever, ear pain, ear stuffiness, red or itchy eyes, headache, facial or sinus pain, facial or sinus pressure, runny nose/nasal discharge, post-nasal drip, swollen glands, shortness of breath, wheezing, pleuritic chest pain, cough, rash or muscle aches.

Other: She is very concerned she has strep throat.

HPI
Overall clinical course is worsening. The illness has caused the patient to restrict their activities. The patient is in a job with high risk of transmitting strep throat. Patient's primary goal in seeking care is to get antibiotics. The patient has sick contacts.

REMEDIES
Patient reports trying cough remedies. Patient reports trying analgesics/antipyretics, which were not effective. Patient reports not trying antibiotics.

PROBLEMS
Borderline hypertension (11/01/2006)
testing (10/26/2006)
RSK Rotator cuff tendonitis (10/18/2006)
Tonsillectomy (10/18/2006)
Ankle pain (10/17/2006)
Appendectomy (10/17/2006)
Cough (10/12/2006)
Graves' disease (10/10/2006)
ARI Smart Form

Decision support: diagnosis

Decision support: treatment

Diagnosis selection leads to diagnosis-appropriate order set
ARI Smart Form

Rapid order selection

Automatic documentation

Workflow complete

Antibiotics
- The drug of choice of strep throat
  - Penicillin 500 mg po bid x 10 days
- Erythromycin 500 mg po bid x 10 days

Prescribe Other Antibiotics

Recommend OTC Medications
- Analgesics & Antipyretics
  - Ibuprofen

- Combination Products
  - Nighttime combination product (e.g., Nyquil)

Recommend
- Fluids and rest
- Salt water gargles
- Call if symptoms worsen, new symptoms arise, or symptoms fail to improve after a total of 14 days

Print
- Patient handout about streptococcal pharyngitis
- Excuse from work note: May return to work in __ days

Other Plan:
CAD / Diabetes Smart Form

- Integrated into a full visit note
- Customized views tailored to medical condition(s) of the patient
- Central note-writing section
  — Multiple ways to document a note
  — “Formlets” for selected coded data entry
- Decision support section
- Patient View
  — Activates patient around goals of care
Smart Forms – a composite application, based on SOA
CAD/DM Smart Form

Smart View: Data Display

Assessment and recommendations generated from rules engine

- Lipids
- Anti-platelet therapy
- Blood pressure
- Glucose control
- Microalbuminuria
- Immunizations
- Smoking
- Weight
- Eye and foot examinations

Documentation Window

Assessment, Orders, and Plan

- No recent LDL measurement
- Patient is on anti-platelet therapy
- Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
- Patient is due for Pneumovax (older than 65, no record of prior vaccination)
- Patient is due for Influenza Vaccine (high risk medical condition)
- Patient may be Current Smoker, not thinking of quitting. Last counseled on 10/10/06.
- Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)
Rules

If patient has DM then goal BP < 130/80

If the average of the blood pressure at the last 2 visits (in the last year) is above goal then return.
CAD/DM Smart Form

Medication Orders

- 20557888 (87 yrs) 01/01/1931
- Lab RCT
- Select
- Desktop
- Pt Chart: Smart Form
- Oncology
- Custom
- Reports

Medication Orders

Lab Orders

- Vital Signs
- T: 99.5
- E/P: 150/75
- H: 70
- RR: 14
- C/O: 20/6

Referrals

- CAD related
  - Diabetes mellitus type 1
  - Coronary artery disease

- DM related
  - Diabetes mellitus type 1

Handouts/Education

Blood Pressure Management

Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)

- Start another Anti-Hypertensives (Help Me Choose)
- Adjust Oretic 25 MG (25MG TABLET take 1) PO QD
- Adjust Lisinopril 20 MG (20MG TABLET take 1) PO QD
- Adjust Acebutolol HCL 200 MG (200MG CAPSULE take 1) PO QD

- Order Chem 7 now
- Order Chem 7 in 4 Weeks
- Referral to Nutritionist
- Referral to Cardiac Rehab (Help Me Choose)
- Referral to Blood Pressure Specialist (Help Me Choose)
- Print "Control High Blood Pressure"
- Print DASH diet instructions
- Print exercise "prescription"
CAD/DM Smart Form

Easy inclusion of assessment and orders into note

Assessment and Plan

Assessment
- No recent LDL measurement
- Patient is on anti-platelet therapy
- Blood Pressure is above goal (avg. over last 2 visits 130/80, goal < 130/80)
- Patient is due for Pneumovax (older than 65, no record of prior vaccination)
- Patient is due for Influenza Vaccine (high risk medical condition)
- Patient may be Current Smoker, not thinking of quitting. Last counsel date is 10/10/06.
- Patient is overweight or obese (BMI 27.1 on 10/31/06, goal < 25)

Plan
- Blood Pressure:
- Adjust Lisinopril 40 MG (40MG TABLET take 1) PO QD
- Order Chem 7 in 1 weeks
- Referral to Nutritionist
- Print "Control High Blood Pressure"
CAD/DM Smart Form: Workflow

Importation of data elements

Automatic inclusion of data (e.g., medications)
CAD/DM Smart Form: Workflow

--- select ---
EXAM: Complete (female)
EXAM: Hip/Knee/Ankle
EXAM: Neck/shoulder
EXAM: gyn
EXAM: Back
EXAM: full neuro
EXAM: MMS

“Dot” macros
CAD/DM Smart Form: Workflow

Physical Examination

- HEENT
  - Extraocular movements
  - Pupils
  - Sclera
  - Conjunctiva
  - Oropharynx

- Neck
  - Neck exam
  - Lymphadenopathy

- Lung
  - Lung auscultation

- Heart
  - Rate and rhythm

http://smartformsintra.partners.org
Blood Pressure

On average, your blood pressure has been running high recently (average of 130/80 from your last two doctor visits). The recommended blood pressure goal is 130/80. You may want to discuss with your doctor about things you can do to help lower your blood pressure.

If you have not had a pneumonia shot, you may want to discuss with your doctor whether you should get a pneumonia shot. Most people with medical conditions such as yours receive a flu shot every year. If you have not had a flu shot this year, you may want to discuss with your doctor’s office whether you should get a flu shot.

Smoking

If you are currently a smoker, you may want to talk to your doctor about ways to help you quit.
ARI and CAD/DM Pre Survey: Overall EHR use

- 223 clinicians responded (response rate 45%).
- Respondents had a mean age of 39 years old and were 40% men.
- Respondents were 197 physicians (88%), 24 nurse practitioners (11%), and 4 other clinician types (2%), including registered nurses and licensed practical nurses.
- Trainees – interns, residents, and fellows – made up 92 (41%) of respondents.
Pre survey contained questions about baseline computer use and about electronic health record use during patient visits.

<table>
<thead>
<tr>
<th>During the visit, do you…</th>
<th>N</th>
<th>Never</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronic health record use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct/update the medication list?</td>
<td>221</td>
<td>24 (11)</td>
<td>45 (20)</td>
<td>85 (38)</td>
<td>67 (30)</td>
</tr>
<tr>
<td>Write at least part of the note?</td>
<td>220</td>
<td>65 (30)</td>
<td>59 (27)</td>
<td>48 (22)</td>
<td>48 (22)</td>
</tr>
<tr>
<td>Correct/update the problem list?</td>
<td>221</td>
<td>53 (24)</td>
<td>95 (43)</td>
<td>52 (24)</td>
<td>21 (10)</td>
</tr>
<tr>
<td>Correct/update health maintenance information?</td>
<td>221</td>
<td>60 (27)</td>
<td>97 (44)</td>
<td>47 (21)</td>
<td>17 (8)</td>
</tr>
<tr>
<td>Write full notes?</td>
<td>218</td>
<td>116 (53)</td>
<td>55 (25)</td>
<td>25 (11)</td>
<td>22 (10)</td>
</tr>
<tr>
<td>Modify the last note or template?</td>
<td>217</td>
<td>103 (47)</td>
<td>68 (31)</td>
<td>31 (14)</td>
<td>15 (7)</td>
</tr>
<tr>
<td>Correct/update other parts of the LMR?</td>
<td>191</td>
<td>102 (53)</td>
<td>50 (26)</td>
<td>30 (16)</td>
<td>9 (5)</td>
</tr>
<tr>
<td><strong>Paper Use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write on the mini face sheet?</td>
<td>210</td>
<td>105 (50)</td>
<td>42 (20)</td>
<td>21 (10)</td>
<td>42 (20)</td>
</tr>
<tr>
<td>Write on a blank piece of paper?</td>
<td>213</td>
<td>74 (35)</td>
<td>75 (35)</td>
<td>32 (15)</td>
<td>32 (15)</td>
</tr>
</tbody>
</table>

*Rows may not add to 100% because of rounding.
Barriers to using the EHR during the patient visit

- The most commonly selected listed reasons for not using the EHR during patient visits were (N=223):
  - loss of eye contact with patient (62%)
  - falling behind schedule (52%),
  - computers being too slow (49%),
  - inability to type quickly enough (32%),
  - feeling that using the computer in front of the patient is rude (31%),
  - preferring to write long prose notes (28%).

- Less commonly indicated barriers included
  - computers “timing out” (19%),
  - a lack of fast, available printers (12%),
  - pop-up blocking software that interfered with the EHR (8%),
  - a lack of computers in some exam rooms (4%).
ARI RCT Post Survey

- A total of 73 intervention clinicians responded for a response rate of 28%.
- 56% (41) had used the ARI Smart Form during the RCT period.
- 75% of survey respondents said they would recommend the ARI Smart Form to a colleague.

<table>
<thead>
<tr>
<th>Questions rated on a scale from 1-7 (1= Strongly Disagree, 7= Strongly Agree)</th>
<th>N responded</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendations in the ARI Smart Form are correct for my patients</td>
<td>41</td>
<td>5.34</td>
</tr>
<tr>
<td>The ARI Smart Form helps me comply better with ARI guidelines</td>
<td>41</td>
<td>4.68</td>
</tr>
<tr>
<td>The ARI Smart Form helps me improve quality of patient care</td>
<td>41</td>
<td>4.37</td>
</tr>
<tr>
<td>The ARI Smart Form is easy to use</td>
<td>40</td>
<td>3.92</td>
</tr>
<tr>
<td>The ARI Smart Form saves me time in the end</td>
<td>41</td>
<td>3.83</td>
</tr>
<tr>
<td>The ARI Smart Form improves my workflow</td>
<td>40</td>
<td>3.87</td>
</tr>
<tr>
<td>The ARI Smart Form has all the functions and capabilities that I expect it to have</td>
<td>40</td>
<td>4.23</td>
</tr>
<tr>
<td>I feel comfortable using the ARI Smart Form</td>
<td>40</td>
<td>4.47</td>
</tr>
<tr>
<td>The ARI Smart Form requires too many &quot;clicks&quot;</td>
<td>41</td>
<td>4.46</td>
</tr>
</tbody>
</table>
We also asked them to rate which Smart Form features they thought were most helpful.

<table>
<thead>
<tr>
<th>Which ARI Smart Form features do you find to be the most helpful?</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizing data</td>
<td>14 (34)</td>
</tr>
<tr>
<td>Calculating risk of strep throat for ARI</td>
<td>13 (32)</td>
</tr>
<tr>
<td>Providing decision support</td>
<td>14 (32)</td>
</tr>
<tr>
<td>Documenting actions</td>
<td>20 (49)</td>
</tr>
<tr>
<td>Making it easier to prescribe medications</td>
<td>14 (32)</td>
</tr>
<tr>
<td>Making it easier to print patient instructions</td>
<td>25 (61)</td>
</tr>
</tbody>
</table>
“Usually I do my notes after clinic ends and so I end up writing down hx and physical in brief short hand but with ARI I did note while patient was still there and did rx via ARI which is great!”

“The link to print work notes and patient information sheets are very nice. I would definitely use this as a documentation tool for URIs. I find it is as fast to use as my templated notes even for very simple things like pharyngitis.

"Overall I like it…And I think the recommendations are good which is obviously the most important thing."
CAD/DM Smart Form Post Pilot Survey

- We asked the CAD/DM pilot users (31) to fill out an online survey after using the CAD/DM Smart Form for 6 weeks.
- 15 pilot users (48%) completed the post pilot survey.
- 11 of these 15 (73%) users also completed the pre survey, allowing us to compare their pre and post responses.
- Of those 15 users, 10 (66%) would recommend the Smart Form to other clinicians unchanged.
- The other 5 suggested improvements we could make to the Smart Form that would make them more likely to recommend it.
- At least two of their suggestions have been implemented already for the RCT release.
CAD/DM Post Pilot Survey

- Survey results suggest that pilot users can see the benefits of using the CAD/DM Smart Form to treat patients with corresponding conditions.
- The majority of pilot clinicians agree that the CAD/DM SF helps them comply better with guidelines (60%) and helps them improve the quality of patient care (67%).

<table>
<thead>
<tr>
<th>Question</th>
<th>% Agree or Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The CAD/DM SF helps me comply better with guidelines</td>
<td>60</td>
</tr>
<tr>
<td>The CAD/DM SF helps me improve quality of patient care</td>
<td>67</td>
</tr>
<tr>
<td>The CAD/DM SF is easy to use</td>
<td>20</td>
</tr>
<tr>
<td>The CAD/DM SF saves me time in the end</td>
<td>7</td>
</tr>
<tr>
<td>The CAD/DM SF improves my workflow</td>
<td>20</td>
</tr>
<tr>
<td>The CAD/DM SF has all the functions and capabilities that I expect it to have</td>
<td>13</td>
</tr>
<tr>
<td>The CAD/DM SF works well with the rest of the office staff</td>
<td>13</td>
</tr>
</tbody>
</table>
# Most helpful Smart Form features

<table>
<thead>
<tr>
<th>Features Most Helpful</th>
<th>% Agree or Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing assessments for each area of disease management</td>
<td>60</td>
</tr>
<tr>
<td>Organizing data</td>
<td>53</td>
</tr>
<tr>
<td>Providing suggested orders based on individual patient data</td>
<td>53</td>
</tr>
<tr>
<td>Printing patient instructions</td>
<td>53</td>
</tr>
<tr>
<td>Requests to provide patient info</td>
<td>47</td>
</tr>
<tr>
<td>Prescribing new medications</td>
<td>40</td>
</tr>
<tr>
<td>Adjusting existing medications</td>
<td>40</td>
</tr>
<tr>
<td>Documenting actions taken in the note</td>
<td>33</td>
</tr>
<tr>
<td>&quot;Help Me Choose&quot; links</td>
<td>27</td>
</tr>
<tr>
<td>Ordering follow-up appointments and referrals</td>
<td>20</td>
</tr>
<tr>
<td>Making it easier to write a visit note</td>
<td>13</td>
</tr>
<tr>
<td>Ordering laboratory tests</td>
<td>13</td>
</tr>
</tbody>
</table>
Pre and Post Comparison

How satisfied are you with your ability to carry out the following components of chronic disease management?

Percent satisfied or very satisfied:

<table>
<thead>
<tr>
<th>Component</th>
<th>Pre Survey %</th>
<th>Post Survey %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>47</td>
<td>57</td>
</tr>
<tr>
<td>Weight</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Diet and Exercise</td>
<td>6</td>
<td>29</td>
</tr>
</tbody>
</table>
CAD/DM SF Feedback

“This is the first LMR item that has allowed updating the health maintenance (smoking status) this is great.”

“I like the graphs…and to be able to put them in the note and have them right there without having to go out of the note is really nice.”

“What I like about the Smart Form is the way it sorts through the med and problem lists.”
More CAD/DM SF Feedback

Alan Cole, MD, Charles River Medical Associates, Chair of Partners Diabetes Council:

“The Smart Form is the easiest way to use the LMR. It provides access to vital signs and most labs and, in addition, permits entry of some data elements (e.g. vital signs and some Health Maintenance items) without screen changes or pop-ups. The Smart Form's decision support functionality assists compliance both by identifying deficits and streamlining most opportunities for correction. There are built-in individualized print-outs that serve as teaching tools that are useful and appreciated. I find myself using the Smart Form 5-10 times every day.”
Elizabeth Mort, MD, MPH, Associate Chief Medical Officer, MGH, HPM3 Team Leader:

“The Smart Form allows me to act on information rather than spending time pulling it together. The trend graphics have made it easier to show patients where they are and where they need to be. I had a very difficult to manage, noncompliant patient with an A1C of 14. Showing the patient and her granddaughter the Patient View was critical in getting the whole family organized to support the patient. Her A1c came down to less than 9.”

Deborah Wexler, MD, MGH Diabetes Center:

The Smart Form is easy to use. It's fast and has some fabulous features (PE, ROS). BRAVO! I really think the Smart Form is time-saving."
What is a Quality Dashboard?

- Physician feedback system
- Clinician-level view of performance on problem-oriented quality indicators
- Comparison to:
  - Clinic
  - National benchmarks
- Drill-down capability
  - Summary measures ➔ List of Individual Patients ➔ Patient Charts/Smart Form
ARI Quality Dashboard Features

- Focus on total and unnecessary antibiotic use
- Narrow vs. broad spectrum antibiotics
- Stratified by type of ARI
- Relatively static because no further action can be taken on that patient
ARI Quality Dashboard

Total ARI cases: 107
Antibiotic prescribing: 40%

% ARI visits

% Broad spectrum prescribed in ARI visits with antibiotics

Narrow spectrum: 1
Broad spectrum: 2

Note: For acute bronchitis and non-specific URIs the national guideline is zero.

Provider Name

Clinic Name

Provider Avg.  Clinic Avg.
ARI QD Feedback

• Users find the ARI QD report with billing data (diagnosis and level of service codes) very useful since this type of reporting that combines LMR data with billing data is new.

• Users find the tool as a good test of system data check since reports are better with better coded value documentation, as opposed to free-text and outside data points.
CAD Quality Dashboard Features

• Focus on several measures of CAD quality
• Graphical and tabular views
• Actionable
  — Individual patient: “drill down” to Smart Form
  — Lists of patients: link to EMR Patient List function for batch letters and documentation
CAD Quality Dashboard

Targets are 90th percentile for HEDIS or for Partners providers

Red, yellow, and green indicators show adherence with targets

Zero defect care:
- Aspirin
- Beta-blockers
- Blood pressure
- Lipids

Zero Defect Care: % of patients with zero deficiencies

<table>
<thead>
<tr>
<th>Measure</th>
<th>My Value (N)</th>
<th>Clinic Average (N)</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE Inhibitor/ARB Management</td>
<td>52% (55)</td>
<td>59% (1093)</td>
<td>&gt; 78%</td>
</tr>
<tr>
<td>BMI Documentation</td>
<td>22% (23)</td>
<td>45% (839)</td>
<td>&gt; 78%</td>
</tr>
<tr>
<td>Smoking Status Documentation</td>
<td>18% (19)</td>
<td>32% (537)</td>
<td>&gt; 97%</td>
</tr>
<tr>
<td>Anti-platelet Management</td>
<td>81% (85)</td>
<td>76% (1473)</td>
<td>&gt; 94%</td>
</tr>
<tr>
<td>Beta-blocker Management</td>
<td>63% (72)</td>
<td>75% (1392)</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>Lipids</td>
<td>27% (28)</td>
<td>50% (929)</td>
<td>&gt; 68%</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>75% (79)</td>
<td>72% (1352)</td>
<td>&gt; 52%</td>
</tr>
<tr>
<td>Zero Defect Care: % of patients with zero deficiencies</td>
<td>0% (0)</td>
<td>1% (14)</td>
<td>&gt; 47%</td>
</tr>
</tbody>
</table>
CAD Quality Dashboard

Blood Pressure Management
BP at goal: 28/104 (27%)

ACE Inhibitor/ARB
- # of patients on ACE/ARB: 55/105 (52%)
- On ACE Inhibitor/ARB: 50
- Not on ACE Inhibitor/ARB: 55

BMI
- # of patients with BMI: 65
- Overweight: 20
- Normal: 85

Antiplatelet
- # of patients on AP: 85/105 (81%)
- On Antiplatelet: 85
- Not on Antiplatelet: 20

Lipid Management
- LDL < 100: 79/105 (75%)
- Overdue: 10
- Not Recorded: 10
- LDL > 100: 10
- LDL < 130: 10

Deficiency Potassium
- Deficiency Potassium: 31
- DP > 5: 24
- DP 1-4: 1
- DP = 0: 0

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### CAD Quality Dashboard

**Blood Pressure Management**

- BP at goal: 29/104 (27%)

**Prioritize by deficiency points**

#### Patients returned: 10

<table>
<thead>
<tr>
<th>Name</th>
<th>MRN</th>
<th>Sex</th>
<th>Age</th>
<th>Visits (Next)</th>
<th>LDL</th>
<th>AP</th>
<th>DB</th>
<th>ACE/ARB</th>
<th>Smoking</th>
<th>BMI</th>
<th>Defic</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>80</td>
<td>M</td>
<td>7</td>
<td>(1/3/06)</td>
<td>85</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>64</td>
<td>M</td>
<td>7</td>
<td>(1/20/06)</td>
<td>80</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>64</td>
<td>M</td>
<td>7</td>
<td>(1/3/06)</td>
<td>99</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>72</td>
<td>M</td>
<td>7</td>
<td>(1/3/07)</td>
<td>130</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>6</td>
</tr>
<tr>
<td>M</td>
<td>78</td>
<td>M</td>
<td>13</td>
<td>(1/5/07)</td>
<td>85</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>39</td>
<td>4</td>
</tr>
<tr>
<td>M</td>
<td>72</td>
<td>M</td>
<td>7</td>
<td>(1/5/07)</td>
<td>53</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>67</td>
<td>M</td>
<td>12</td>
<td>(1/7/06)</td>
<td>79</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Active (7/17/07)</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>M</td>
<td>73</td>
<td>M</td>
<td>4</td>
<td>(1/7/06)</td>
<td>32</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N/A</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>M</td>
<td>86</td>
<td>M</td>
<td>10</td>
<td>(1/10/06)</td>
<td>108</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>5</td>
</tr>
<tr>
<td>M</td>
<td>65</td>
<td>M</td>
<td>12</td>
<td>(1/29/06)</td>
<td>64</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>3</td>
</tr>
</tbody>
</table>

**Sort**
CAD Quality Dashboard

Filter. For example, patients with blood pressure not at goal who have had 0 or 1 visit in the past year.

Clicking on name opens patient’s Smart Form.

<table>
<thead>
<tr>
<th>Lipids</th>
<th>Blood Pressure</th>
<th>Smoking Status</th>
<th>BMI</th>
<th>Anti-platelet</th>
<th>Beta-blocker</th>
</tr>
</thead>
<tbody>
<tr>
<td>At goal: $&lt;100$</td>
<td>At goal</td>
<td>Meet goal</td>
<td>At goal</td>
<td>Meets goal</td>
<td></td>
</tr>
<tr>
<td>LDL $&gt;=100$</td>
<td>Above goal</td>
<td>Do not meet goal</td>
<td>Above goal</td>
<td>Not on (indicated/not contraindicated)</td>
<td></td>
</tr>
<tr>
<td>LDL $&gt;130$</td>
<td>Markedly above goal</td>
<td>Recently quit</td>
<td>Markedly above goal</td>
<td>Contraindicated</td>
<td></td>
</tr>
<tr>
<td>Overdue</td>
<td>Out of date</td>
<td>Out of date</td>
<td>Out of date</td>
<td>Not indicated</td>
<td></td>
</tr>
<tr>
<td>Not recorded</td>
<td>Not recorded</td>
<td>Not recorded</td>
<td>Not recorded</td>
<td>Not indicated</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACE-I/ARB</th>
<th>Future Visits</th>
<th>Visits in last year</th>
<th>Sex</th>
<th>Age</th>
<th>Zero Defect Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets goal</td>
<td>No scheduled visit</td>
<td>0</td>
<td>Female</td>
<td>$&lt;10$</td>
<td>1</td>
</tr>
<tr>
<td>Not on (indicated/not contraindicated)</td>
<td>Within 1 week</td>
<td>1</td>
<td>Male</td>
<td>12-40</td>
<td>2</td>
</tr>
<tr>
<td>Contraindicated</td>
<td>Within 2 weeks</td>
<td>2</td>
<td>Unknown</td>
<td>41-50</td>
<td>3</td>
</tr>
<tr>
<td>Not indicated</td>
<td>Within 1 month</td>
<td>3</td>
<td></td>
<td>51-60</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Within 3 months</td>
<td>4</td>
<td></td>
<td>61-70</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>71-80</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td>$&gt;80$</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients returned: 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

Create a new list: [ ]

Save to My Lists | Export To Excel
CAD QD Feedback and Pilot Results

In general, pilot user feedback has been positive. All the physicians have commended the disease-specific snapshot reporting tool that allows them to navigate between measures and drill down to a specific patient view easily.

- Users like the ability to define the query and create their own list of CAD patients starting from the base set that the system generates.
- Users like the ability to see the snapshot view graphically as well as in summary format.
- Users find the tool as a good test of system data check since reports are better with better coded value documentation, as opposed to free-text and outside data points.
Quality Dashboards ↔ Smart Forms

Smart Forms and Quality Dashboards work together to improve quality.

Smart Forms capture structured information that informs Quality Dashboards.

Quality Dashboards allow clinicians to “drill-down” from a population view to individual patient Smart Forms to address quality deficiencies.

Same data feeds Quality Dashboards and Smart Forms.
Evaluation

1. Usability testing

2. Pilot testing

3. Randomized controlled trials
Development and Usability Testing

• Focus Groups
• Prototype development
• Iterative refinement
• Pilot Testing
  — Real time on-line feedback
  — Surveys before and after use
  — Usability Lab
  — Interviews by outside consulting firm
## ARI Smart Form – Pilot Results

<table>
<thead>
<tr>
<th></th>
<th>Smart Form Pilot</th>
<th>Previous Season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visits, N</td>
<td>Antibiotic, N (%)</td>
</tr>
<tr>
<td>Antibiotic Appropriate Diagnosis</td>
<td>6</td>
<td>6 (100)</td>
</tr>
<tr>
<td>Non-Antibiotic Appropriate Diagnosis</td>
<td>20</td>
<td>3 (15)</td>
</tr>
</tbody>
</table>
### CAD/DM Smart Form – Pilot Results

<table>
<thead>
<tr>
<th></th>
<th>Smart Form Pilot</th>
<th>Previous 6 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deficiency</td>
<td>Deficiency</td>
</tr>
<tr>
<td></td>
<td>Addressed</td>
<td>Addressed</td>
</tr>
<tr>
<td>Beta-Blocker Rx or CI</td>
<td>3/134 (2.2)</td>
<td>2/3 (66.7)*</td>
</tr>
<tr>
<td></td>
<td>2/3 (66.7)*</td>
<td>24/924 (2.6)</td>
</tr>
<tr>
<td></td>
<td>24/924 (2.6)</td>
<td>1/24 (4.2)</td>
</tr>
<tr>
<td>Up to Date Blood Pressure</td>
<td>14/134 (10.5)</td>
<td>13/14 (92.9)*</td>
</tr>
<tr>
<td></td>
<td>13/14 (92.9)*</td>
<td>133/924 (14.4)</td>
</tr>
<tr>
<td></td>
<td>133/924 (14.4)</td>
<td>43/133 (32.3)</td>
</tr>
<tr>
<td>Smoking Status documented</td>
<td>45/134 (33.6)</td>
<td>11/45 (24.4)*</td>
</tr>
<tr>
<td></td>
<td>11/45 (24.4)*</td>
<td>339/924 (36.7)</td>
</tr>
<tr>
<td></td>
<td>339/924 (36.7)</td>
<td>21/339 (6.2)</td>
</tr>
<tr>
<td>Up to Date Height and Weight</td>
<td>95/134 (70.9)</td>
<td>10/95 (10.5)*</td>
</tr>
<tr>
<td></td>
<td>10/95 (10.5)*</td>
<td>634/924 (69.6)</td>
</tr>
<tr>
<td></td>
<td>634/924 (69.6)</td>
<td>34/643 (5.3)</td>
</tr>
</tbody>
</table>

*\( p < 0.05 \)
Randomized Controlled Trials

- ARI Smart Form
  — Completed, analysis in progress
- CAD Diabetes Smart Form
  — In progress
- ARI Quality Dashboard
  — Nearing completion
- CAD Quality Dashboard
  — To begin after CAD DM Smart Form RCT completed
Challenges

- Dependence on external software development
- Physician vs. clinic level randomization
- Reconciling research agendas of several simultaneous IT projects
- Creating knowledge management infrastructure
Dependence on Software Development

- Smart Forms dependent on outpatient order entry and on LMR services
- Delayed product development and RCT start
- **Solutions**
  - Get development support at highest levels
  - Make needs clear
  - Prioritize and pick battles
  - Minimize dependence if possible
- **Lesson Learned:** Anticipate and manage
Physician vs. Clinic Level Randomization

• Clinic level
  — Pros: training and support easier, minimizes contamination
  — Cons: clustering by clinic, potential for uncontrolled confounding

• Physician level
  — Pros: no clustering, more effective randomization
  — Cons: training and support more difficult, potential for contamination among physicians

• Lessons Learned: be flexible and willing to re-evaluate as situations change
Reconciling Research Agendas of Multiple IT Projects

- Questions to Ask: How similar are...
  - The interventions?
  - Target patient populations?
  - External requirements?
  - Logistics of implementation
  - Outcomes to be measured?
Reconciling Research Agendas of Multiple IT Projects

• Conversion to multiple arm study
  — Good when overlapping interventions and outcomes
  — Sacrifices statistical power
• Simultaneous studies in different populations
  — Good when populations can be separated
• Simultaneous studies in same population (e.g., 2x2 factorial design)
  — Good when little chance of synergy between interventions
• Head to head comparison
  — Good when no overlap, each can serve as control for the other
• Lessons learned: need for broad dialogue among stakeholders
Creating Knowledge Management Infrastructure

• **Cons**
  — Large up-front investment
  — Potential delays in design
  — Bureaucracy

• **Pros**
  — Mechanism for connecting subject matter experts with programmers
  — Much more scalable as decision support expands

• **Solutions:**
  — Knowledge management group
  — I-log software
Creating Knowledge Management Infrastructure

- Lessons learned
  - Flow diagrams for subject matter experts
  - Other formats for analysts & programmers
  - Finalize logic among small group
  - Public e-space to promote dialogue
  - Detailed indexing of all logic elements
    - Re-use
    - Prevent redundancy
Lessons Learned: General

• Pilot data encouraging to date
• Potential synergy between Smart Forms and Quality Dashboards
• New paradigms for decision support
Lessons Learned: Smart Forms

• Major barriers to use relate to workflow and human factors issues

• Coded data entry
  — What is the correct amount?
  — May depend on complexity of condition, degree to which data influences decision support, billing requirements, style of individual practitioner
Lessons Learned: Smart Forms

• ARI
  — Greater impact on promoting appropriate antibiotic use than discouraging inappropriate use?
  — Better coding of diagnoses vs. more appropriate care
  — So far, limited to stand-alone ARI visits
• Will be addressed in future versions
Lessons Learned: Smart Forms

- CAD/DM
  - Impact greater on documentation than on clinical inertia?
  - Biggest barrier is change to current workflow
  - Future versions will incorporate health maintenance, other acute and chronic conditions, other features to make it more appealing to use
  - Can we reach the tipping point?
Lessons Learned: Quality Dashboards

• Biggest barriers to use are related to the health care system
  — What are the drivers (carrots and sticks) to QD use?
    • Pay for performance
    • Reimbursement for case management
  — For chronic diseases, QD may be more effective as a case management tool
Lessons Learned: Quality Dashboards

• Other major barrier is related to quality of the data
  — Absolute need to tie patients to providers, edit panels, deal with missing data
  — Won’t change behavior unless the data are believable

• Big societal trends will drive quality measurement
  — Can providers be proactive? (EHR data better than billing data)
Lessons Learned: HIT Research

- Challenges include IT implementation among providers, external dependencies, randomization issues, competing interventions, and knowledge management
- Concurrent RCTs superior to before-after trials if can be done
- Anticipate and manage problems, but be prepared to be flexible if conditions change
Conclusions

• Smart Forms and Quality Dashboards offer new paradigms to manage acute and chronic medical conditions using EHR technology
• Both have potential to improve care, demonstrate EHR value to providers, and drive EHR use
• Much work remains to be done
Managing Smart Forms Project

Highlights from the past 3 years
HIT project from the management perspective

- Challenges
  - Tough goal
  - Smart, motivated people
  - New challenges every day

- Rewards
  - Tough goal
  - Smart, motivated people
  - New challenges every day

vase or 2 faces?
Challenges

Every stage has its own unique challenges

— Development
— Study design
— Implementation
— Data analysis
— Manuscript preparation
Development

- Software created was very complex
  - Different forms (ARI and CAD)
  - LMR dev team has its own agenda
  - Involvement of other Partners’ departments (KM)
  - Incorporating usability expertise and feedback
- Design challenges
- Consideration of needs of a diverse group of clinicians
- Financial struggle to support developers for research purpose (CAD QD)
- Any dev delays caused delays for whole project
Study design and data collection

- Multiple research studies ongoing at Partners created a need for very careful study design and complicated randomization schemas
- Lack and disparate information (PCP lists, residents lists)
- On-line surveys yielded typical response rate
Training and implementation

• Selling the idea to practices
  — Practice leaders
  — End users: physicians and residents
• Implementation
  — Accommodate practice readiness & scheduling
• Training
  — Comply to needs of different users
  — Provide personal training if needed
• Support after implementation
• Additional resources for implementation process would help to increase usage
Analysis

- Time consuming and tedious
- Extremely complex programming
- Cleaning data requires on-going involvement of co-investigators
- Data retrieval process
  — Unique for BWH and MGH patient data
  — No central place to get data
Team issues

- Strong personalities with different ideas
- Not everyone is born to be a perfect team player
- Loss of key people during the study
Nature of doing HIT research at Partners

- Co-investigators and PI work on numerous projects
- Work between physicians and developers
- Cooperation with different groups (CITL, CIRD, QDM) – necessary, hard, and beneficial
- Partners culture around research work
  - Why research is needed
  - What research needs are
  - Issues with access to research DB, data, etc.
- Distance between
  - Research team and co-investigators
  - Research team and clinics
  - Co-investigators and developers
How did we succeed?

• Team excellence
  — Right team composition
  — Experience in different areas
  — Previous research experience
  — Goal oriented
  — Ability to manage team challenges
• High involvement of co-investigators at all stages of the grant
• Previous experience with conducting similar research at Partners
• Early determination of research questions and data of interest (Analysis Plan)
Strong management & project management

- Decision-making hierarchy (buck stopped with the PI)
- High involvement of co-investigators
- Communication / negotiation skills
- Careful proactive planning for every project stage
- Weekly meeting for the whole team
- Agenda and “To-Do” items on weekly basis
- Documentation of all steps (including research DBs development)
- Learning during Pilot stages to have smooth RCTs
Rewards

• Accomplishing difficult tasks
• Positive feedback from physicians
• Results dissemination at national conferences and through manuscripts
• Getting feedback from a wide range of researchers
• Making a difference in patient care?
Where Are We?
Discussion, Q&A

Thank you!
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